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IMPORTANT

This manual may not contain information on all changes that have occurred to the subject instrument since the manual issue date. It was prepared for use by IEC authorized factory-trained service or dealer personnel who are kept current through a program of service letters and bulletins and training seminars.

This manual contains *warnings* against operating procedures which could result in an accident and/or personal injury. It also contains *cautions* against procedures which could result in damage to your centrifuge or accessory equipment. Read this manual thoroughly before operating or servicing this centrifuge.

1 INTRODUCTION

The IEC Centra-CL2 is a compact benchtop centrifuge designed for multipurpose use in medical, industrial, and scientific laboratories.

There are two models:

- Cat. No. 426 for 120 V, 50/60 Hz
- Cat. No. 427 for 240 V, 50/60 Hz

The Centra-CL2 accommodates a wide variety of rotors, including fixed angle and horizontal (swinging bucket). IEC AeroCarriers™ provide aerosol containment along with autoclaveability. The CL2 can handle up to 300 ml (801 rotor), and reach maximum speeds of up to 8500 rpm (841 fixed angle rotor) and 3900 rpm (236 horizontal rotor).

Other important features of the CL2 are a cover interlock for safety, and a 'glove-friendly' membrane control panel with digital speed and time displays. An 'At Speed' timer mode allowing for accurate separations, and a continuous 'hold' mode are also featured.

2 INSTALLATION

After unpacking, place the unit on a clean, level surface. The surface must be level to ensure quiet, vibration-free operation. A rigid, stable location is important since an improperly loaded unit can vibrate or even move. Allow a space of 3 in. (7.6 cm) on each side and 4 in. (10.2 cm) in the rear of the unit for ventilation. Ensure that the suction cup feet grip the surface firmly.

Using a voltmeter, measure the line voltage to ensure it is within the limits for your model. For Cat. No. 426 the line voltage should be between 108 and 132 VAC. For Cat. No. 427 the line voltage should be between 216 and 264 VAC. Variations in line voltage or frequency will affect the unit's speed and acceleration.

Before moving, unplug the centrifuge and remove all accessories and the rotor.

Clearance Envelope

International Electrotechnical Commission standard 1010 part 2-20 limits the permitted movement of a laboratory centrifuge to 300mm in the event of a disruption. The user should therefore mark the clearance envelope boundary around the centrifuge, or laboratory management procedures should require that no person or any hazardous materials are within such a boundary while the centrifuge is operating.

3 OPERATION

3.1 Warnings and Cautions

Warnings To Avoid Electric Shock:

- Plug the power cord into a grounded outlet.
- Never remove the grounding prong from the power plug, or use any adapter which does not complete the grounding circuit.
- Always unplug the power cord before attempting to clean or service the centrifuge.

Cautions

- DO NOT exceed maximum rated speed for each rotor/accessory combination. Maximum speeds can be found in Section 4.1 Speed And Force Tables. All IEC rotors and accessories are stamped with their cat. no. for easy identification.
- Samples of specific gravity higher than 1.2 require the maximum speed to be derated.
- Ensure that loads are properly balanced around the rotor to minimize vibration. All IEC accessories are stamped with their weight for easy balancing.
- Do not block the vents, otherwise, airflow will be restricted.
- Be sure the rotor and accessories are properly installed before attempting to start a run.

3.2 Opening The Cover

STOP/COVER OPEN

Once the red light over the STOP button is steadily illuminated (no longer flashing) pressing the COVER OPEN button on the control panel will release the interlock, allowing the cover to be opened.

3.3 Rotor Installation

When the unit has power, the red light over the STOP button is illuminated. This is also an indication that the rotor is stopped and the cover can be opened. Push the COVER OPEN lever to the right and lift the cover. Lower the rotor straight onto the shaft. Screw the knurled metal locking nut (clockwise) onto the shaft to hold the rotor down (on some rotors, you must remove any sample tubes first.). Tighten the nut with your fingers; do not use a tool.

Rotors with or without a keyway can be used on the Centra-CL2 since there is no key on the shaft.

3.4 Starting And Stopping A Run

ARROW

TIME

SPEED

START

STOP

To start a run, use the ARROW buttons to set the desired run time (0 to 30 minutes) in the TIME display, and the desired rpm in the SPEED display. Press the START button. The green light under the START button will illuminate, and the time display will begin counting down. The actual speed is displayed in the SPEED display. The centrifuge will run for the set duration and decelerate to a stop. To terminate a run before time expires, press the STOP button. The red light over the STOP button illuminates when STOP is pressed or time expires, and it flashes until the rotor comes to a stop.

Note: The cover may be opened when the rotor speed is below 20 RPM.

The time and speed settings cannot be changed during a run. A new run cannot be started until the rotor has come to a complete stop.

For infinite spins (hold mode), use the arrow keys to scroll up past 30 minutes. The word 'HOLD' appears in the display. Pressing the START button will begin a run which can only be terminated by pressing the STOP button. In the hold mode, the timer counts up.

To select the timing mode, use the arrow buttons to scroll down past 0 seconds. The letters 'Spd' or 'Acc' will appear. Press the arrow buttons to toggle between the two timing modes. **'Spd'** is the 'At Speed' timing mode where the timer starts counting down when rotor reaches 95% of set speed. **'Acc'** is the normal timing mode where the timer begins to count down as soon as the run button is pressed.

3.5 Rotor Removal

To remove a rotor, first remove any sample tubes, shields, and other accessories from the rotor. Next, unscrew (counterclockwise) approximately one full turn the knurled locking nut. Then place both thumbs on the knurled locking nut and grip the rotor with the fingers. Push your thumbs down and at the same time pull the rotor up with your fingers. This should dislodge the rotor from the shaft. If unsuccessful, **lightly tap** the knurled metal locking nut with a rubber/plastic mallet or other similar object. The nut and the rotor can now be removed from the shaft.

3.6 Balance

A balanced load is essential with all centrifuges. An unbalanced load produces vibration and can damage the unit. A 2-gram load imbalance, at a speed of 4600 rpm, imparts force equivalent to 9.1 kg at rest (20 pounds). Therefore, always ensure that the rotor is loaded symmetrically and with a full (or paired) set of tubes. Tube adapters should also be installed symmetrically.

IEC rotors are dynamically balanced at the factory. IEC matches removable parts (trunnion rings, shields, cups and carriers) to within 1 gram and stamps the weight on each piece. Check these markings whenever you interchange parts, to ensure that opposite parts are matched. Ensure that the total weight of samples and removable parts loaded in opposing positions are equal in weight to within 1 gram. The position numbers, present on many rotors and adapters, identify opposing tube positions.

To obtain good dynamic balance, the opposite loads must not only be equal in mass, but must also have the same center of gravity. Opposing containers must be alike in shape, thickness, and distribution of glass or plastic. This is especially important for large containers.

Tubes loaded into swinging bucket rotors must likewise be symmetric around the axis of rotation. Verify this by rotating the entire rotor 180° by hand: the loads should be in the same apparent positions (not in the mirror image). In addition, the loads within each bucket must also be symmetric around the bucket's pivot axis. Verify this by ensuring that each bucket is loaded so that it does not tilt from the vertical when the rotor is at rest. Maintaining balance within each bucket ensures that the bucket and the tubes swing out to horizontal when the rotor reaches operating speed, applying centrifugal force toward the bottom of the tubes. Failure to achieve full swing-out causes vibration and premature wear.

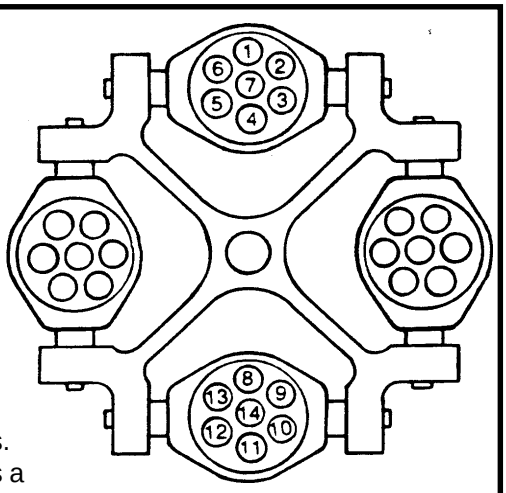
Samples of different specific gravities can be processed in the same run, provided that the samples of a given type are balanced around the rotor as though they were the only ones in the rotor.

For example, load tubes in the following manner:

1. Load four tubes.
   Positions 3, 6, 10, 13
   or 2,5,9,12
   or 1,4,8,11

2. Load six tubes.
   Positions 6,7,3,13,14,10
   or 5,7,2,12,14,9
   or 1,7,4,8,14,11

3. Load an odd number of tubes.
   Not recommended (unless a dummy tube is used for balance.)



4 APPLICATIONS

This section describes the use of specific rotors and accessories. More detailed information is often shipped with the rotor or accessory itself. This section contains four reference tables:

4.1 Speed And Force Table
4.2 Derating Table for Dense Samples
4.3 Chemical Resistance Table
4.4 Decontamination Table
4.5 Nomograph

Relative centrifugal force (RCF or G-force) at a given speed varies with the rotor, and with the length of the sample tube, because the distance of the tube's tip from the center of rotation is different. The Speed and Force Table indicates the maximum speed and RCF the Centra-CL2 can achieve with various rotor/accessory combinations.

The Derating Table specifies reductions in rpm when spinning samples with specific gravity above 1.2.

Misapplication of any tube can cause tube rupture. To avoid this, compare the G forces specified in the Speed and Force Table with the ratings for the tubes you are using. If the tubes are not rated for the force the centrifuge will apply, reduce the speed to the G force limit of your tubes.

Your IEC centrifuge is made of materials designed to resist attack from most laboratory chemicals. The interior of the rotor chamber is Painted steel. Rotors and accessories placed in the chamber are made of a variety of materials, including aluminum and polypropylene. The Chemical Resistance Table shows the suitability of each material with different classes of reagents.

The Decontamination Table lists compatible methods of decontamination which may be used on the IEC Centra-CL2 centrifuge.

The Nomograph provides an easy method of converting RPM to RCF (or xg).

Section 5.1 describes how to clean and remove corrosion from the chamber, rotors, and accessories. Follow these instructions, and clean spills promptly, to minimize the effects of corrosive chemicals, before any resulting chemical attack requires more expensive repair. Replace metal locking nut, rotors, or accessories if they become cracked, deformed, or gouged.

Rotor 215: 4-Place Swinging Bucket Rotor							
Tube No. x Vol.	Tube	Maximum RPM / RCF	Radius	Tr. Ring	Shield or Carrier	Adapter	Cushion
8x50ml	Falcon/Corning Conical plastic	3100 / 1510	14.1	4x326	8x320	-	8x315
8x50ml	Corning 8300-50 conical glass	3100 / 1510	14.1	4x326	8x320	-	571
8x15ml	Falcon/Corning Conical plastic	3100 / 1510	14.1	4x326	8x320	8x1106	570
4x50ml	Falcon/Corning Conical plastic	3350 / 1750	13.9	4x325	4x320	-	4x315
4x50ml	Corning 8300-50 conical glass	3350 / 1750	13.9	4x325	4x320	-	571
4x15ml	Falcon/Corning Conical plastic	3350 / 1750	13.9	4x325	4x320	4x1106	570
4x50ml sealed	Falcon/Corning Conical plastic	3175 / 1750	15.4	4x350	4x323	-	315
4x15ml sealed	Falcon/Corning Conical plastic	3350 / 1750	13.9	4x325	4x320	4x1106	4x668
4x15ml sealed	Falcon/Corning	3175 / 1710	15.2	4x350	4x7323	1106	4x571
4x10-15ml sealed	Vacutainer 16x100-125mm	3176 / 1710	15.2	4x350	4x7323	1106	4x668
4x7ml sealed	Vacutainer 13x100mm	3175 / 1710	15.2	4x350	4x7323	4x1105	4x571
12x10ml	16x100mm	3450 / 1725	12.9	4x366	4x1013	-	570
12x7ml	16x75mm	3450 / 1725	12.9	4x366	4x1013	-	570
16x7ml	13x100mm	3450 / 1700	12.8	4x366	4x1018	-	667
16x5ml	13x75mm	3450 / 1700	12.8	4x366	4x1018	-	667
20x5ml	12x75mm	4000 / 1975	11.1	4x366	4x369	-	567
20x3ml	10x75mm	4000 / 1975	11.1	4x366	4x369	-	567

Rotor 221: 6-Place Fixed Trunnion Swinging Bucket							
Tube No. x Vol.	Tube	Maximum RPM / RCF	Radius	Tr. Ring	Shield or Carrier	Adapter	Cushion
6x15ml	Falcon/Corning	3100 / 1650	15.4	Fixed	6x303	-	668
6x12.5ml	Kimble 45170-125	3100 / 1650	15.4	Fixed	6x303	-	668
6x12ml	IEC 1629, 1649	3100 / 1570	14.6	Fixed	6x303	-	570
6x10ml	Corning 8080-10	3500 / 1890	13.8	Fixed	6x356	-	668
6x10ml	IEC 2046, 2067	3500 / 1780	13.0	Fixed	6x356	-	570

Rotor 236: 4-Place Aerocarrier Horizontal Swing-Out Rotor							
Tube No. x Vol.	Tube	Maximum RPM / RCF	Radius	Tr. Ring	Shield or Carrier	Adapter	Cushion
4x50ml	Falcon/Corning	3400 / 1950	15.0	Fixed	4x2091S	-	-
8x15ml	Falcon/Corning	3400 / 2000	15.5	Fixed	4x2092S	-	-
8x10ml	Kova/UriSystem	3400 / 2000	15.5	Fixed	4x2092S	-	-
16x10ml	Vacutainer 16x100mm	3700 / 2200	14.3	Fixed	4x2093S	-	-
16x7ml	Vacutainer 13x100mm	3701 / 2200	14.3	Fixed	4x2093S	-	-
16x7ml	Hemogard Vacutainer 13x100mm	3700 / 200	14.3	Fixed	4x2093S	-	-
28x7ml	Vacutainer 16x75mm	3900 / 2150	12.7	Fixed	4x2094S	-	-
28x5ml	Vacutainer 13x75mm	3901 / 2150	12.7	Fixed	4x2094S	-	-
28x5ml	Hemogard Vacutainer 13x75mm	3900 / 2150	12.7	Fixed	4x2094S	-	-

Rotor 801: 6-Place 45 Degree Fixed Angle Rotor							
Tube No. x Vol.	Tube	Maximum RPM / RCF	Radius	Tr. Ring	Shield	Adapter	Cushion
6x50ml	Falcon/Corning Conical plastic	3900 / 2050	12.1	-	6x305	-	6x315
6x50ml	Corning 8300-50 conical glass	3900 / 2050	12.1	-	6x305	-	571
6x15ml	Falcon/Corning Conical plastic	3900 / 2050	12.1	-	6x305	6x1106	570
6x50ml	Falcon/Corning Conical plastic	4500 / 2450	10.8	-	6x320	-	6x315
6x50ml	Corning 8300-50 conical glass	4500 / 2450	10.8	-	6x320	-	571
6x15ml	Falcon/Corning Conical plastic	4500 / 2450	10.8	-	6x320	6x1106	570

Rotor 804S: 4-Place 40 Degree Fixed Angle Rotor							
Tube No. x Vol.	Tube	Maximum RPM / RCF	Radius	Tr. Ring	Shield	Adapter	Cushion
4x50ml	Falcon/Corning Conical plastic	4200 / 2270	11.5	-	323	-	315
4x50ml	Corning 8300-50 conical glass	4200 / 2270	11.5	-	323	-	571
4x15ml	Falcon/Corning Conical plastic	4200 / 2270	11.5	-	323	6x1106	570
4x60ml	Corning 8540-60	2500 / 1000	14.3	-	4x341	-	572

Rotor 809: 12-Place 45 Degree Fixed Angle Rotor							
Tube No. x Vol.	Tube	Maximum RPM / RCF	Radius	Tr. Ring	Shield	Adapter	Cushion
12x15ml	Falcon/Corning conical plastic	3800 / 2150	13.3	-	302	-	668
12x15ml	Corning 8080-15 conical glass	3800 / 2050	12.7	-	302	-	570
126xDevice	Amicon Filtration Device	3800 / 2050	13.4	-	302	-	-
12x10ml	Corning 8080-10	4500 / 2310	10.2	-	12x356	-	570
12xDevice	Filtron or Millipore Devices	4500 / 2490	11.0	-	12x356	-	-
12x10ml	Corning 8080-10	4100 / 2270	12.1	-	12x303	-	12x668
12x10ml	17x102mm	4100 / 2120	11.3	-	12x303	-	570

Rotor 841: 12-Place 45 Degree Fixed Angle Rotor							
Tube No. x Vol.	Tube	Maximum RPM / RCF	Radius	Tr. Ring	Shield	Adapter	Cushion
12x1.5-2.0ml	microtubes	8500 / 4680	5.8	-	-	-	-
12x0.7ml	microtubes	8500 / 4770	5.9	-	-	5763	-
12x0.5ml	microtubes	8500 / 3960	4.9	-	-	5763	-
12x0.4ml	microtubes	8500 / 4680	5.8	-	-	5764	-
12x0.25ml	microtubes	8500 / 3630	4.5	-	-	5764	-

4.2 Derating Table for Dense Samples

The Speed and Force Table lists the Maximum speed for each rotor/ accessory combination in the Centra-CL2. IEC guarantees that the units can achieve these speeds when used at nominal voltage.

These speeds are guaranteed only with samples whose specific gravity is not greater than:

1.2 for swinging bucket rotors
1.5 for angle rotors

For denser samples, the maximum guaranteed speed is reduced (derated) by a factor from the table below:

	Derating Factor for:	
Specific Gravity	Swinging Bucket	Fixed Angle
1.2	1	1
1.3	.960	1
1.4	.925	1
1.5	.894	1
1.6	.866	.967
1.7	.839	.939
1.8	.816	.912
1.9	.794	.888
2.0	.774	.866
2.1	.755	.844
2.2	.738	.825
2.3	.721	.807
2.4	.707	.790
2.5	.692	.774
2.6	.678	.758
2.7	.666	.744
2.8	.654	.731
2.9	.642	.719
3.0	.632	.707

Example. An angle rotor rated for 5,000 rpm, used with samples with a specific gravity of 1.6, should not be spun faster than (5,000 x .967 =) 4,835 rpm.

Specific gravities greater than 3.0. This table is based on the formula:

$$\sqrt{(s_0/s_a)}$$

...where s_0 is the maximum specific gravity allowed before derating (1.2 or 1.5, depending on the type of rotor), and s_a is the actual specific gravity of the sample in question. You can use the same formula to compute derating factors for specific gravities greater than 3.0.

4.3 Chemical Resistance Table

	Plastic										Metal					Other			
	PA	PC	PE	PP	PU	NL	DN	CN	NN	PS	TI	SS	AL	MB	MG	RR	BN	VN	PF
Acids, dilute or weak	E	E	E	E	G	E	F	N	F	E	G	G	F	F	N	F	E	E	E
Acids*, strong or conc.	E	N	E	E	F	N	N	N	N	F	N	N	N	N	N	N	F	G	N
Alcohols, aliphatic	E	G	E	E	F	E	E	E	N	E	E	E	E	E	F	E	E	G	E
Aldehydes	G	F	G	G	G	G	G	G	F	N	E	E	E	E	E	E	N	E	E
Bases	E	N	E	E	N	G	N	G	F	E	E	E	E	E	E	G	G	N	N
Esters	G	N	G	G	N	E	G	G	E	N	E	E	E	E	E	N	N	N	E
Hydrocarbons, aliphatic	G	F	G	G	E	N	E	E	E	N	E	E	E	E	E	N	E	E	E
Hydrocarbons, aromatic	F	N	G	F	N	N	E	E	E	N	E	E	E	E	E	N	N	E	E
Hydrocarbons, halogenated	F	N	F	F	N	N	G	E	G	N	E	E	E	E	N	N	N	F	E
Ketones	G	N	G	G	N	N	E	E	E	N	E	G	G	G	E	N	N	N	E
Oxidizing Agents, strong	F	N	F	F	N	N	N	N	N	N	E	F	N	N	N	N	F	E	E
Salts	E	E	E	E	E	E	E	E	E	E	E	F	F	F	N	E	E	E	E

*For Oxidizing Acids, see "Oxidizing Agents, strong".

PA - POLYALLOMER
PC - POLYCARBONATE
PE - POLYETHYLENE
PP - POLYPROPYLENE
PU - POLYURETHANE
NL - MODIFIED PHENYLENE OXIDE (NORYL)
DN - ACETAL HOMOPOLYMER (DELRIN)
CN - ACETAL COPOLYMER (CELCON)
NN - NYLON
PS - POLYSTYRENE

TI - TITANIUM
SS - STAINLESS STEEL
AL - ALUMINUM
MB - MANGANESE BRONZE
MG - MAGNESIUM
RR - RUBBER
BN - BUNA-N
VN - VITON
PF - PHENOLIC FIBER

Classification of Resistance

E= Excellent
G= Good
F= Fair
N= Not Recommended

4.4 Compatible Processes For Decontamination

Compatible Processes For Decontamination																				
Sterilization Methods	Plastic										Metal					Other				
	PA	**PC**	**PE**	**PP**	**PU**	**NL**	**DN**	**CN**	**NN**	**PS**	**TI**	**SS**	**AL**	**MB**	**MG**	**RR**	**BN**	**VN**	**PF**	**PT**
Mechanical																				
Autoclave*	S	M	U	S	M	U	S	S	S	U	S	S	S	S	S	S	S	M	S	M
Ethylene Oxide Gas	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	U	S	S	S
Dry Heat 160°C@2Hrs.	U	U	U	U	U	U	U	U	U	U	S	S	U	S	S	U	U	U	U	U
Chemical																				
Ethanol	S	S	S	S	U	S	S	S	U	M	S	S	S	S	S	S	S	S	S	S
40% Formalin	S	S	S	S	U	S	S	S	S	U	S	S	S	S	S	S	U	S	S	S
Methanol	S	M	S	S	M	S	S	S	U	M	S	S	S	S	S	S	S	U	S	S
2-Propanol	S	S	S	S	M	S	S	S	U	S	S	S	S	S	M	S	S	S	S	S
.5% Sodium Hypochlorite**	S	S	S	S	U	S	U	U	U	S	S	M	U	U	U	S	U	S	S	M
3% Hydrogen Peroxide	S	S	S	S	S	S	M	S	U	S	S	S	S	S	U	S	S	S	S	M
100% Hydrogen Peroxide	S	S	S	S	S	U	U	U	U	S	S	S	S	S	S	U	U	S	S	U
5% Phenol Solution	M	U	U	S	U	U	M	M	U	M	M	M	M	M	M	M	U	S	S	U

*For Oxidizing Acids, see "Oxidizing Agents, strong".

PA - POLYALLOMER
PC - POLYCARBONATE
PE - POLYETHYLENE
PP - POLYPROPYLENE
PU - POLYURETHANE
NL - MODIFIED PHENYLENE OXIDE (NORYL)
DN - ACETAL HOMOPOLYMER (DELRIN)
CN - ACETAL COPOLYMER (CELCON)
NN - NYLON
PS - POLYSTYRENE

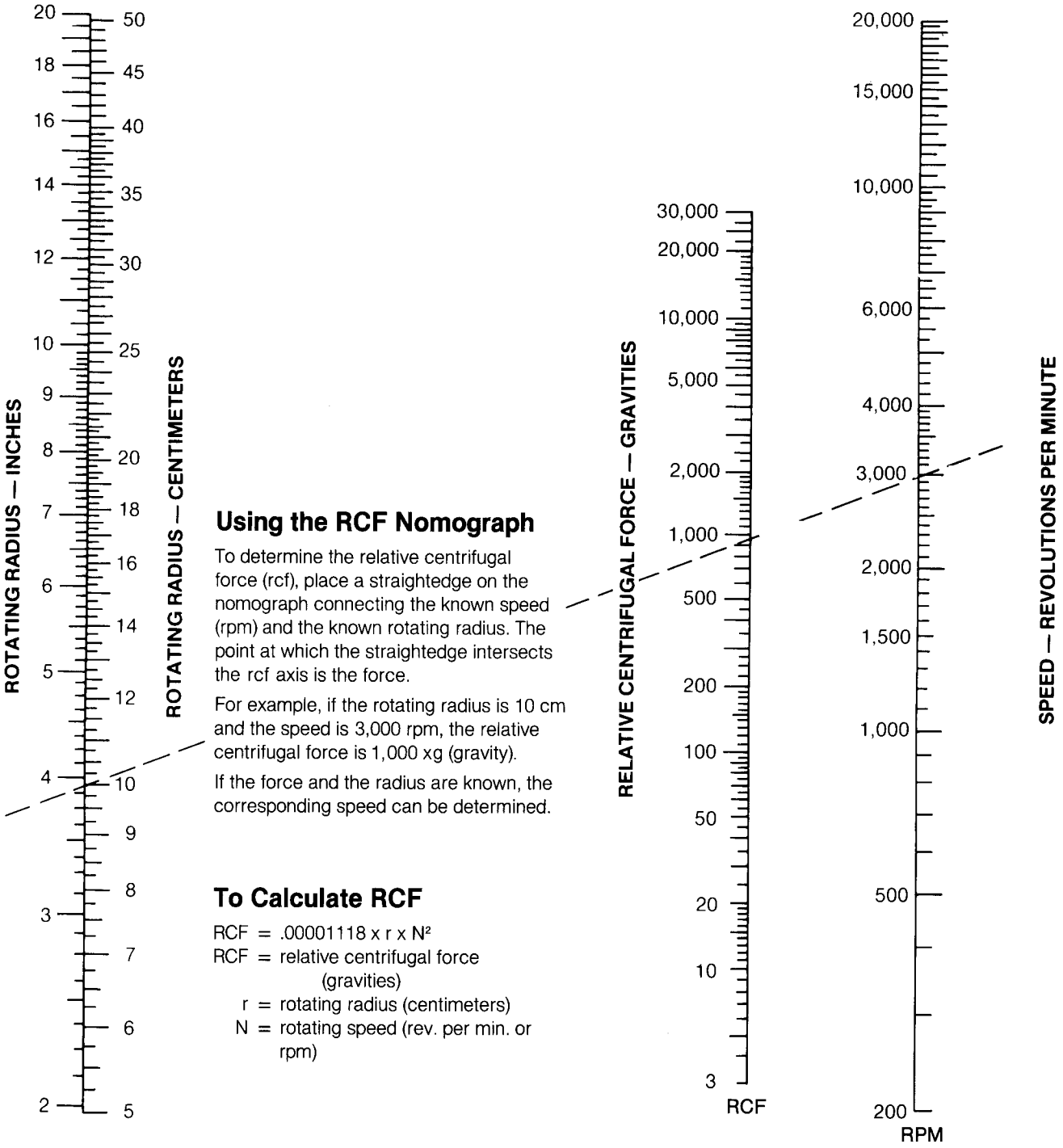
TI - TITANIUM
SS - STAINLESS STEEL
AL - ALUMINUM
MB - MANGANESE BRONZE
MG - MAGNESIUM
RR - RUBBER
BN - BUNA-N
VN - VITON
PF - PHENOLIC FIBER
PT - PAINTED SURFACES

*Autoclaving
12°C 20 min. @
2 ATM (15 PSIG)

**Household Bleach
(1:10 Dilution)
S = SATISFACTORY
M = MARGINAL
U = UNSATISFACTORY

WARNING:
This chart describes the material compatibility of various sterilization methods. It does not specify the adequacy of sterilization. Refer to section 4.3 Chemical Resistance Table for material compatibility during centrifugation.

4.5 Nomograph



Using the RCF Nomograph

To determine the relative centrifugal force (rcf), place a straightedge on the nomograph connecting the known speed (rpm) and the known rotating radius. The point at which the straightedge intersects the rcf axis is the force.

For example, if the rotating radius is 10 cm and the speed is 3,000 rpm, the relative centrifugal force is 1,000 xg (gravity).

If the force and the radius are known, the corresponding speed can be determined.

To Calculate RCF

$RCF = .00001118 \times r \times N^2$

RCF = relative centrifugal force (gravities)

r = rotating radius (centimeters)

N = rotating speed (rev. per min. or rpm)

5 MAINTENANCE

5.1 Cleaning

Keep your centrifuge clean to ensure good operation and to extend its life. Clean the entire sample chamber, rotor, and lid at the end of each workday, and also right after any spill.

To clean the sample chamber, use a damp sponge, warm water, and a mild liquid detergent suitable for washing dishes by hand, such as Ivory® liquid. Do not use caustic detergents or detergents that contain chlorine ions, since these attack metals. Remove stubborn stains with a plastic scrub pad. Do not use steel wool, wire brushes, abrasives, or sandpaper, since they create corrosion sites. Never pour water directly into the sample chamber. Scrub the rotor's tube cavities with a stiff test-tube brush that has end bristles and a nonmetallic tip. After cleaning any part, dry it properly, preferably using a clean, absorbent towel.

Corrosion

IEC manufactures and finishes rotors and structural accessories to give maximum resistance to corrosion. However, maximum equipment life requires that you continually inspect the rotor cavities for corrosion, especially after using chloride ion solutions, such as sodium chloride (saline), and sodium hypochlorite (household bleach). These solutions attack most metals. Clean the rotor, rotor chamber, and accessories (particularly the sample compartments and bucket cups) thoroughly after each such use. Inspect all surfaces under bright light for corrosion; small crevices will grow deeper and cause failure.

If you see any corrosion, remove it immediately as follows:

1. Follow the cleaning procedure at the start of this section. Soak the part in the mild hand-dishwashing detergent. Scrub the part thoroughly with a stiff test-tube brush having end bristles and a non-metallic tip.

2. Soak the part again in clear warm water for at least an hour.

3. Rinse the part thoroughly in warm water first, then in distilled water.

4. Dry the part thoroughly with a clean, absorbent cloth.

5. If this procedure does not remove the corrosion, **discontinue use of the part.**

Storage

Store parts on a soft surface to avoid damaging finished surfaces. Rotors and other parts should be clean and dry for storage. Store them open to the atmosphere, not in a plastic bag, so that any residual moisture will evaporate. The parts should face downward to avoid retaining moisture in the cavities.

Decontamination

Decontamination is called for if tube breakage occurs and infectious, pathogenic, or radioactive material is released into the unit. Some rotors or accessories totally contain the sample tubes. In this case, spillage is usually confined, and it may be sufficient to decontaminate only the rotor or accessory.

The Decontamination Table lists the sensitivity of various materials to common sterilization procedures. When using a 1-to-10 dilution of household bleach (sodium hypochlorite) to decontaminate metal rotors or accessories, follow decontamination by the corrosion cleaning procedure given earlier, since chloride ions attack most metals.

Always decontaminate for the minimum recommended time. If you observe corrosion, remove it as described earlier, discontinue use of the sterilization method, and use an alternate decontamination procedure.

Sterilization of polypropylene rotors can be done by autoclaving. Remove any sample tubes before autoclaving, unless they are completely full of sample, or remove caps, stoppers, and other tube closures, before autoclaving to keep the tubes from collapsing under pressure. Autoclave the rotor and accessories at 121° C @ 15 psig for 20 minutes. Do not stack polypropylene rotors during autoclaving. After the rotor is cool to the touch, do a normal cleaning operation as described above.

Repeated autoclaving will seriously degrade the performance of polycarbonate materials.

5.2 Brush Replacement

Refer servicing to qualified personnel only. Brush replacement is required when the length of the brush not including the spring is less than 1/4 inch long. **Order additional sets as IEC Part Number 1780A.**

WARNING DISCONNECT POWER CORD BEFORE REMOVING THE BRUSHES.

First, remove all rotor and accessories from the chamber. Gently tilt the unit onto its side and remove the four screws which secure the baseplate. The brush caps are located on either side of the motor housing. Unscrew each cap with your fingers (or use a small flat screwdriver) and remove the brushes. There are two black caps which can be removed from the housing to allow use of a large screwdriver. Measure the length of the brushes and replace both brushes if either one is less than 1/4 of an inch long. Be sure to reinstall all parts removed.

It is important to check the brushes periodically since damage to the motor can occur if the brush is allowed to wear down to the spring.

CAUTION: WHEN REINSTALLING INSPECTED BRUSHES
When brush replacement is not required, it is important that the brush be inserted in the same position as it was removed. The trailing edge of the brush must be positioned properly. The trailing edge may be identified by the presence of a dark deposit of carbon along that side.

Note: New brushes may require a burn-in period of up to a half hour.

5.3 Fuse Replacement

Refer servicing to qualified personnel only. First, remove all rotor and accessories from the chamber. Gently tilt the unit onto its side and remove the four hex head screws which secure the baseplate. Unscrew and remove the four rubber feet and lift the baseplate off. The fuse(s) is mounted to the cabinet housing. Replace fuse(s) with:

For 100/120 VAC	1 - 4A, .25 x 1.25 in.	IEC part no. 40340
For 220/240 VAC	2 - 2A, .25 x 1.25 in.	IEC part no. 40794

5.4 Cover Interlock Bypass

The Centra-CL2 has an interlock bypass for easy sample retrieval in the event of a power failure. To bypass the safety interlock, unplug the centrifuge and pry off the plastic plug located on the bottom of the control panel. Pull downward on the cord to release the interlock. Do not perform this bypass routinely. The cover interlock provides user safety and allows the cover to be opened promptly whenever rotation has stopped.

5.5 Calibration

The speed sensor used in the Centra-CL2 requires no calibration. IEC recommends verifying its speed once every 24 months. This can be done easily using an optical tachometer through the clear plastic viewport in the lid. If this measurement indicates instrument failure, please notify IEC Technical Service.

5.6 Power Cord Replacement

Inspect the power cord every four months for signs of wear. Refer servicing to qualified personnel only. Replace power cord with IEC part number 44392 only.

5.7 Warranty

Warranty information is provided on the warranty card supplied with the centrifuge.

5.8 Condition of Returned Equipment

Before returning equipment to IEC, you must contact IEC or your dealer and receive a return goods authorization (RGA). **All returned units must be decontaminated, free of radioactivity, and free of hazardous and infectious materials.** The RGA paperwork includes a Certificate of Decontamination for you to sign indicating that you have performed these steps. IEC will not accept the shipment until this signed certificate is received.

You must prepay transportation to the service depot.

6 SPECIFICATIONS

Rotation Speed	8500 rpm (Angle Rotor No. 841) 3900 rpm (Horizontal Rotor No. 236)
Maximum RCF	4775 xg (Angle Rotor No. 841) 2200 xg (Horizontal Rotor No. 236)
Maximum Volume	400 mL (8 x 50 mL)
Timer	
Range	0 to 30 minutes
Increments	0 to 1 minute by 5 seconds 1 to 5 minutes by 15 seconds 5 to 30 minutes by 1 minute HOLD mode up to 99 min., 99 sec.
Accuracy	±1.0 %
Speed	
Range	1000 to 8500 rpm by 100 rpm
Accuracy	±100 rpm
Power Requirement	120 VAC ± 10%, 60 Hz (Cat. No. 426) 240 VAC ± 10%, 50 Hz (Cat. No. 427)
Heat Output (typical)	175 Watts (600 Btu/hr.)
Sound Level	65 dB(A)
Height	
Cover Closed:	11 in. (28 cm)
Cover Opened:	24 in. (61 cm)
Width	13 in. (34 cm)
Depth	16 in. (40 cm)
Net Weight	11 kg (24 lbs.)
Shipping Weight	13 kg (29 lbs.)

Specifications Subject To Change Without Notice

7 SERVICE

7.1 Warning Messages and Error Codes

The following Warning Messages and Error Codes can appear in the display of the Centra-CL2. A Warning Message indicates improper opeartion, and may be cleared by opening the lid, correcting the problem, and then using the centrifuge. Error Codes indicate a malfunction of the centrifuge. They are cleared by disconnecting and reconnecting power to the centrifuge. If an Error Code or Warning Message persist, service may be required.

Warning Messages:

LId: The cover was not properly closed when the start button was pressed, or the cover was opened during a run.

PFL: Power to the centrifuge was lost during a run.

Error Codes:

Er 1: Tachometer signal not present during a run.

Er 2: Speed is 500 RPM over set speed and not decelerating for more than 2 seconds, or speed is over 9000 RPM at any time.

Er 10: The motor voltage was detected to be over the maximum limit (94 volts).

7.2 General

Trouble Shooting If the centrifuge won't start, check the following in order to isolate a problem:

If the rotor stopped indicator (red LED) is lit, there is power to the centrifuge. If not, unplug the centrifuge and check the fuse(s) per Section 5.3.

Spin the rotor by hand to see that the rotor stopped indicator begins flashing, and listen for the latch to engage. This will verify the function of the tachometer and latch.

Warnings: The following hazards exist in servicing the Centa-CL2:

The unit uses AC power, and some of the service procedures require operation with panels removed, exposing power lines. This introduces the risk of electric shocks. Service should be performed by qualified personnel only. Do not touch exposed wires without first unplugging the unit.

Cautions: An additional hazard to the equipment is as follows:

The circuit boards contain electronics that can be damaged by static electricity. Persons doing extensive maintenance on the circuit boards, or removing individual components from the circuit boards, should be grounded (such as by wearing a wrist strap.) When shipping a circuit board, always enclose it in a static-protective bag.

7.3 Disassembly For Service

First, open the cover and unplug the centrifuge. To access the electrical components, remove the rotor and accessories from the chamber. Gently tilt the unit onto its side and remove the four hex head screws which secure the baseplate. Unscrew and remove the four rubber feet and lift the baseplate off.

With the cover open, remove the four screws (two on each side) from the control tower. Gently pull the tower outward without removing it completely (there are wires connecting it to the chamber).

To remove the guard bowl, locate and remove the 9 Phillips head screws at the base of the centrifuge chamber. To remove the cover from the guard bowl, pry off one end cap from the hinge pin. Slide the pin out.

7.4 Interlock

The IEC Centra-CL2 has a safety interlock which prevents the cover from being opened unless the rotor is turning 20 RPM or less. There is a switch in the interlock assembly which senses that the cover is closed and locked. It is a normally open switch and closes when the solenoid is in the locked position. When pressed, the STOP/COVER OPEN button releases the safety interlockby powering the solenoid through the Interlock PC board.

The solenoid coil has a resistance of approximately 80 W. Power to the solenoid should be approximately 170 VDC. Voltage is provided by the Interlock PCB when the STOP/COVER OPEN button is pressed.

Note: The following procedure involves operating the unit with panels removed. Refer to Section 7.1 Warnings.

To measure the voltage, disconnect the solenoid at JP4 and read across the

BRN and YEL leads. Verify the function of the switch using an ohmmeter.

To replace the interlock, remove the four screws which secure the latch assembly to the cabinet. Snip the wire ties in order to disconnect all leads to the latch assembly. Make note of wiring before disconnecting. Reconnect wires as noted, or using the diagram provided at the end of this manual.

The slots in the latch assembly mounting bracket are for proper positioning. Raise or lower the height of the assembly so that when the cover is closed completely switch SW1 (WHT and WHT/BLK leads) is engaged by the roll pin of the solenoid plunger. A run may not be started until the switch is engaged.

7.5 Timer PCB

The IEC Centra-CL2 has a Timer/Display PCB mounted behind the membrane control panel. The timer PCB contains the EPROM and delivers power to the motor. To replace it, the tower must first be removed (see Section 7.2). The PCB is secured to the tower by four screws

Note: To prevent damage to the PC board, always use a static protective device (such as wriststrap) when handling or servicing.

7.6 Motor

The IEC Centra-CL2 uses an AC series wound drive motor. The motor is not a singular replaceable component, as the base housing of the centrifuge serves as the motor housing. The motor is made up of an armature (includes bearings), field, brushes, brush holders, brush caps, brush leads, and a magnetic rotor. All of these parts are available separately (as well as motor bearings) for repair purposes.

When isolated, the armature resistance should be approximately 6.3 W. This can be measured by disconnecting the RED and WHT motor leads and measuring the resistance across them. When isolated, the field resistance should be approximately 10 W. It can be measured by disconnecting the Red and BLK motor leads (BLK at BR1).

To access the motor, remove the baseplate (see Section 7.2) and then the top cap located in the guard bowl. Two Phillips head screws secure the top cap. When removing the top cap, take care not to lose the pre-load washer which rests on top of the upper bearing.

To replace the armature, the brushes must be removed (see Section 5.2), and the magnetic rotor taken off of the motor shaft. Magnetic rotor removal requires that the Interlock PCB be removed (see Section 7.6). It is secured with Loctite® 454. Use care not to break the magnetic rotor. Once brushes and the magnetic rotor have been removed, the armature simply lifts out of the housing.

The field rests inside the housing. To remove it, simply disconnect the three

motor leads (RED, WHT, BLK) and lift it out.

Located below the field are the two set screws which secure the brush holders in place. To replace or adjust a brush holder, loosen the set screw. This allows the brush holder to be moved or removed. The set screw may be accessed through the two holes in the field through which the top cap mounting screws secure the top cap to the base.

7.7 Interlock PC Board

The Interlock PCB in the IEC Centra-CL2 disables power to the interlock during rotation. This PC board is mounted below the motor. To sense rotation, it uses a Hall effect sensor to pickup pulses form a magnetic disk mounted on the motor shaft.

To replace the PCB, disconnect the wiring harness and remove the four mounting screws which secure the PCB to the base housing. Take care not to damage the speed sensor when lifting the PCB off of the housing.

Note: To prevent damage to the PC board, always use a static protective device (such as wriststrap) when handling or servicing.

8 DRAWINGS

The following drawing are included in this manual.

Dwg. No.	Description
426	CL2 Assembly
PL-426	CL2 Parts List (120 VAC)
PL-427	CL2 Parts List (240 VAC)
10857	Wiring Diagram
10895	Timer/Display PCB Schematic
44416	Timer/Display PCB Layout
PL-44416	Timer/Display PCB Parts List
10875	Interlock PCB Schematic
44418	Interlock PCB Layout
PL-44418	Interlock PCB Parts List

These drawings were accurate at the time of publication. Changes do occur. If you have any questions regarding these drawings, please contact IEC Technical Support at (800) 843-1113.

INSTRUCTION MANUAL
IM-426

Revision 8

Centra-CL2
Centrifuge
Cat. No. 426 -- For 120 VAC, 50/60 Hz
Cat. No. 427 -- For 240 VAC, 50/60 Hz